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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

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| IN RE APPLICATION OF | : |
| HARTMUT HIBST, ET AL. | : EXAMINER: PATEL, SMITA S |
| SERIAL NO: 10/567,029 | : |
| FILED: FEBRUARY 3, 2006 | : GROUP ART UNIT: 1732 |
| FOR: METHOD FOR THE SEQUENTIAL PRODUCTION OF A HETEROGENEOUS CATALYST LIBRARY | : |

# APPEAL BRIEF

SIR:

The following is an appeal of the examiner's final rejection of June 29, 2011 of claims 7-8 and 10-27 as obvious. A Notice of Appeal was timely filed on September 19, 2011.

## (i) *Real Party In Interest*

The real party in interest is BASF SE, formerly known as BASF Aktiengesellschaft, by assignment recorded at reel/frame 019318/0857-59.

## (ii) *Related Appeals And Interferences*

Appellants, appellants' legal representative and the assignee are not aware of any related appeals and interferences which will directly affect or be directly affected, or have a bearing on the Board's decision in the pending appeal. Any copies of decisions rendered by a court or the Board, if any, in any proceeding identified would be attached as related proceedings appendix (x).

(iii) *Status Of Claims*

Appellants' state the status of all the claims in the proceeding as follows:

Claims 7, 8 and 10-27 are rejected and active in this application and are herein appealed.

No claims have been identified as allowed or confirmed.

No claims have been identified as withdrawn.

No claims have been identified as objected to.

Claims 1-6 and 9 have been canceled.

(iv) *Status Of Amendments*

No amendment after final rejection has been requested. A copy of the claims herein appealed is attached as appendix (viii).

(v) *Summary Of Claimed Subject Matter*

The claimed invention is directed to a process for the sequential production of a library of N different solids, comprising heterogeneous catalysts, wherein N, within a day of beginning production, is an integer of at least 2, the process comprising (page 4, lines 12-14 and page 5, lines 21-22)

a) producing at least two different sprayable solutions, emulsions and/or dispersions of elements and/or element compounds of the chemical elements present in the catalysts, (page 4, lines 16-19)

b) continuously metering the at least two different solutions, emulsions and/or dispersions in a predefined ratio into a mixing apparatus in which the solutions, emulsions and/or dispersions are homogeneously mixed to form a mixture, (page 4, lines 21-23)

c) continuously drying the mixture removed from the mixing apparatus, wherein the drying is performed by spray drying or spray-freeze drying, to produce a dried mixture, and recovering the dried mixture that is a solid, and (page 4, lines 25-26 and page 8, lines 8-10)

d) changing the ratios in b) and repeating b), c) and d) (N-1) times until N different solids are obtained; (page 4, lines 28-29)

wherein the ratio in b) and d) is set and changed by changing or adapting the flow velocities of the different solutions, emulsions and/or dispersions during the metering into the mixing apparatus and the total stream of the individual solutions, emulsions and/or dispersions remains constant during the metering in the mixing apparatus and to the drying. (page 9, lines 18-20, and 31-33)

Claim 7 is the only independent claim involved in this appeal, whose subject matter is defined above.

No means plus function or step plus function as permitted by 35 U.S.C. 112, sixth paragraph are used and therefore none are identified.

Combinatorial library production allows for rapid generation of compositions to be screened for activity. Rapid and efficient efforts to prepare libraries of heterogeneous catalysts for screening are sought.

The claimed invention addresses this problem by providing a process for the sequential production of a library of N **compositionally** different solids, comprising heterogeneous

catalysts, comprising a) preparing at least two different sprayable compositions, b) continuously metering a predefined ratio of the at least two different sprayable compositions into a mixing apparatus, forming a mixture, c) continuously drying to produce a dried mixture and recovering, and d) changing the ratios in step b) until N **compositionally** different solids are obtained, wherein the ratio in b) and d) is set and changed by **changing or adapting the flow velocities of the different solutions**, emulsions and/or dispersions during the metering into the mixing apparatus and **the total stream of the individual solutions**, emulsions and/or dispersions **remains constant** during the metering in the mixing apparatus and to the drying. Appellants have discovered such a process to provide for efficient and rapid production of a library of N **compositionally** different solids. Such a process is nowhere disclosed or suggested in the cited art of record.

(vi) *Grounds Of Rejection To Be Reviewed On Appeal*

1) The rejection of claims 7, 8 and 10-27 under 35 U.S.C. §103(a) over Ushikubo et al. in view of Sun et al. U.S. 6,689,613, in view of Schunk et al. U.S. 2001/0039330, in view of Lugmair et al. U.S. 2004/0110636 and in further view of Otake et al. U.S. 4,520,127 is presented for review.

(vii) *Argument*

The examiner has committed reversible error in concluding the claimed invention to be obvious over the cited references as none of the cited prior art of record discloses or suggests a process in which N **compositionally** different solids are obtained wherein the **total stream**

of individual solutions, emulsions and/or dispersions **remains constant** when changing the ratio in step b).

Ushikubo et al. disclosed a process for preparing **a** catalyst by spray drying a solution or slurry containing Mo, V and Te (see abstract). Prescribed amounts of starting materials corresponding to the composition of the desired complex oxide are mixed with a solvent such as water (page 3, lines 39-42) which is then dried by spray or freeze drying (page 3, lines 56-57). Contrary to the assertion made on page 3 of the official action, there is no disclosure of metering at least two different solutions. **A single solution** of all of the components of the desired oxide catalyst are simply combined and dried. There is no disclosure of preparing a library of different solids. A constant total stream in the production of a library of catalysts is irrelevant to this disclosure since multiple catalysts are not being prepared.

Sun et al. discloses a method of **screening a** combinatorial **library** by reacting with a carbon source and screening the products for the production of carbon fibrils (see abstract and example 1). In an embodiment for preparation of the catalyst library, an array of liquid dispensers are programmed to dispense liquids onto a substrate, dried and calcined (column 3, lines 12-24). Thus, while liquids are dispensed, dried and calcined in the preparation of a library, there is no disclosure of a total stream remaining constant in the preparation of **compositionally** different solids. There is no disclosure of changing the ratio of solutions in the preparation of different solids nor of a total stream of individual solutions remaining constant (page 3 of official action).

Schunk et al. discloses a process for producing **arrays** of heterogeneous catalysts by coating channels in an array with a predetermined amount of materials to provide a

predetermined composition, followed by treating with a reactive gas, and heating, if necessary (see abstract). Paragraph [0099] as been cited for disclosing continuous metering in the preparation of a heterogeneous catalyst library. However, this section merely describes **only metering** catalyst precursors from separate vessels into the channels. There is no disclosure of varying the ratio of metering of at least two different solutions, nor maintaining the total stream of the individual solutions as constant.

Lugmair et al. discloses a combinatorial approach in which **a catalyst** is subject to different **mechanical treatments**, providing an array of materials for catalysis research (see abstract). The mechanical treatments do not substantially alter the chemical composition of the catalysts. There is no disclosure of preparing **compositionally** different solids. A constant total stream is irrelevant to this disclosure since a library of compositionally different catalyst compositions are not being prepared.

Otake et al. discloses a process for preparing an oxidation catalyst composition, wherein components containing V, P and silica sol are combined to form an aqueous slurry, spray-dried and calcined (see abstract). In the spray drying process, the supply of the aqueous slurry and the rotational speed of the disk are controlled so that the average particle size is more uniform (column 8, lines 36-59). The **composition** of the aqueous slurry is **static** and any changes to the supply of the slurry and rotational speed of the disk does not alter the composition of the solid particles.

In contrast, the claimed invention is directed to a process in which the total stream of individual components **remains constant** during the metering in the preparation of

**compositionally** different solids. There is no disclosure or suggestion to form a library of compositionally different solids using a constant total stream of individual solutions.

### *No Disclosure of A Constant Total Stream In The Preparation Of Compositionally Different Solids*

The examiner has committed reversible error by concluding the claimed invention to be obvious in the absence of any evidence to suggest a constant total stream in the preparation of compositionally different solids. Only Sun et al and Schunk et al. prepare compositionally different materials. However, each reference does so by simply dispensing liquids to arrive at the desired composition. In doing so there is no disclosure as to the volume of liquid used to achieve the different materials. Therefore, there is no suggestion of maintaining a constant total stream in the preparation of compositionally different solids.

On page 5 of the official action the examiner asserts that it would have been obvious to use a constant total stream in order to control particle size. While Otake et al. discloses control of the supply of a slurry and the rotational speed of a disk, in the drying of a static composition, there simply would have been no motivation to have maintained a constant total stream in the preparation of compositionally different solids. The goal of achieving compositionally different materials would preclude any motivation to maintain a constant stream using at least two different spray solutions.

*No Motivation To Combine Teachings of Lugmair et al. and Otake et al.*

While it is not exactly clear as to how Lugmair et al. and Otake et al. are being relied upon, appellants note that Lugmair et al. prepares catalyst materials having a particular size distribution by grinding and sieving (paragraph [0008]). The particle distributions are not obtained by drying a solution of catalyst.

In contrast, Otake et al. forms a uniform particle size distribution by control of the solution supply and rotational speed of disks. Thus, the particle size is adjusted through the specifics of the dying technique.

Since Lugmaier et al. employs a mechanical force followed by classification, while Otake et al. uses drying conditions to adjust particle size, the teachings of the two references are simply not combinable.

*Otake et al. Describes A Homogeneous Composition*

As noted above, Otake et al. describes controls of the particle size of a catalyst material by adjusting the drying conditions in terms of the supply of solution and rotational speed of the disk. Such drying parameters do not alter the composition of the catalyst material. As such, the conditions used to obtain a particular particle distribution would not suggest conditions to obtain compositionally different catalyst compositions. More specifically, even if Otake et al. were to disclose a constant supply of solution to a disk, such a technique would be irrelevant to supply of solutions in the **preparation** of catalyst compositions.

*No Disclosure In Otake et al. Of Varying Flow Velocities While Maintaining A Constant Total Stream*

At best, Otake et al. would describe supplying a constant volume of a compositionally static solution to a disk while drying. In such a fashion the particle size could be controlled. Such a process does not suggest in any way adjustment of stream velocities of **different solutions**, while maintaining a constant total stream. There is a world of difference between maintaining a constant volume in controlling particle size and maintaining a constant total stream while adjusting stream velocities in preparing compositionally different catalyst compositions.

As the cited art fails to disclose the claimed aspect of the total stream of individual solutions, emulsions and/or dispersions remaining constant, the claimed invention would not have been obvious. The examiner has committed reversible error and her decision as to obviousness must be reversed.

In view of the deficiencies of the cited reference, the decision of the primary examiner must be reversed.

Respectfully submitted,

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## (viii) *Claims Appendix*

Claim 7 A process for the sequential production of a library of N different solids, comprising heterogeneous catalysts, wherein N, within a day of beginning production, is an integer of at least 2, the process comprising

a) producing at least two different sprayable solutions, emulsions and/or dispersions of elements and/or element compounds of the chemical elements present in the catalysts,

b) continuously metering the at least two different solutions, emulsions and/or dispersions in a predefined ratio into a mixing apparatus in which the solutions, emulsions and/or dispersions are homogeneously mixed to form a mixture,

c) continuously drying the mixture removed from the mixing apparatus, wherein the drying is performed by spray drying or spray-freeze drying, to produce a dried mixture, and recovering the dried mixture that is a solid, and

d) changing the ratios in b) and repeating b), c) and d) (N-1) times until N different solids are obtained;

wherein the ratio in b) and d) is set and changed by changing or adapting the flow velocities of the different solutions, emulsions and/or dispersions during the metering into the mixing apparatus and the total stream of the individual solutions, emulsions and/or dispersions remains constant during the metering in the mixing apparatus and to the drying.

Claim 8 The process as claimed in claim 7, wherein a time period between mixing the solutions, emulsions and/or dispersions and drying is a positive time period of less than 10 minutes.

Claim 10 The process as claimed in claim 7, wherein the different solids are produced in each case in amounts of from 0.1 to 500 g.

Claim 11 The process as claimed in claim 7, wherein the ratio in b) is set and changed by central computer control of output of pumps which in each case separately transport the different solutions, emulsions and/or dispersions into the mixing apparatus.

Claim 12 The process as claimed in claim 7, wherein the solids obtained in d) are tested for a desired catalytic property by a process comprising,

separately introducing the individual solids into multiple reactors, and subsequently testing each solid for the desired catalytic property.

Claim 13 The process of claim 7, wherein N is at least 9.

Claim 14 The process of claim 7, wherein N is at least 45.

Claim 15 The process of claim 7, wherein N is at least 90.

Claim 16 The process of claim 7, wherein N ranges from at least 2 to 5,000.

Claim 17 The process of claim 7, wherein N ranges from at least 2 to 50,000.

Claim 18 The process of claim 7, wherein the different solids are produced in each case in amounts of from 1 to 100 g.

Claim 19 The process of claim 7, wherein the at least two different sprayable solutions, emulsions, and/or dispersions each have a dissolved solids content and/or a solids content of 0.5 to 50% by weight, based on the total weight of the solution, emulsion and/or dispersion.

Claim 20 The process of claim 7, wherein the at least two different sprayable solutions, emulsions, and/or dispersions each have a dissolved solids content and/or a solids content of 1 to 30% by weight, based on the total weight of the solution, emulsion and/or dispersion.

Claim 21 The process of claim 7, wherein each sprayable solution, emulsion and/or dispersion comprises a unique element compound.

Claim 22 The process of claim 21, wherein each unique element compound is differently selected from one of ammonium heptamolybdate, ammonium metavanadate, ammonium paratungstate, iron (II) nitrate, iron (III) nitrate, silver nitrate, bismuth nitrate, iron sulfate, titanium oxysulfate, niobium oxalate, antimony titrate, or niobium tartrate.

Claim 23 The process of claim 21, wherein each unique element compound comprises a unique catalytically active metal.

Claim 24 The process of claim 23, wherein each unique catalytically active metal is, individually, selected from subgroup V and/or subgroup VI of the Periodic Table of the Elements.

Claim 25 The process of claim 23, wherein each unique catalytically active metal is selected from the platinum group of the Periodic Table of the Elements.

Claim 26 The process of claim 7, wherein each sprayable solution, emulsion and/or dispersion comprises a unique element.

Claim 27 The process of claim 26, wherein each unique element is a metal and/or transition metal.

(ix) *Evidence Appendix*

none

(x) *Related Proceedings Appendix*

none